



TX431 Adjustable Precision Shunt Regulator

Features

- Programmable Precise Output Voltage from 2.5V to 36V
- Low Temperature Deviation: 5mV Typical
- Low Equivalent Full-range Temperature Coefficient with 50PPM/°C
- Sink Current Capacity from 1mA to 100 mA
- Low Output Noise
- Wide Operating Range of -40 to 125°C
- ROHS/Halogen Free

Applications

- Charger
- Voltage Adapter
- Switching Power Supply
- Graphic Card
- Precision Voltage Reference

General Description

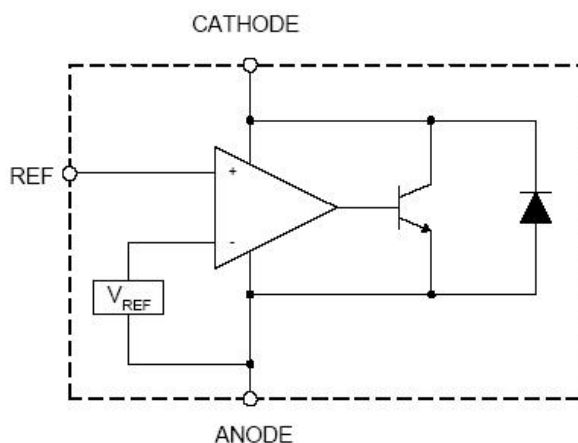
The TX431 is a three-terminal adjustable shunt regulator with guaranteed thermal stability over a full operation range. It features sharp turn-on characteristics, low temperature coefficient and low output impedance, which make it ideal substitute for Zener diode in applications such as switching power supply, charger and other adjustable regulators.

The output voltage of TX431 can be set to any value between V_{ref} (2.495V) and the corresponding maximum cathode voltage (36V).

The TX431 precision reference is offered in two voltage tolerance: 0.5% and 1%.

This IC is available in 2 Packages: SOT-23 and TO92.

Block Diagram





TX431 Adjustable Precision Shunt Regulator

Pin Assignment

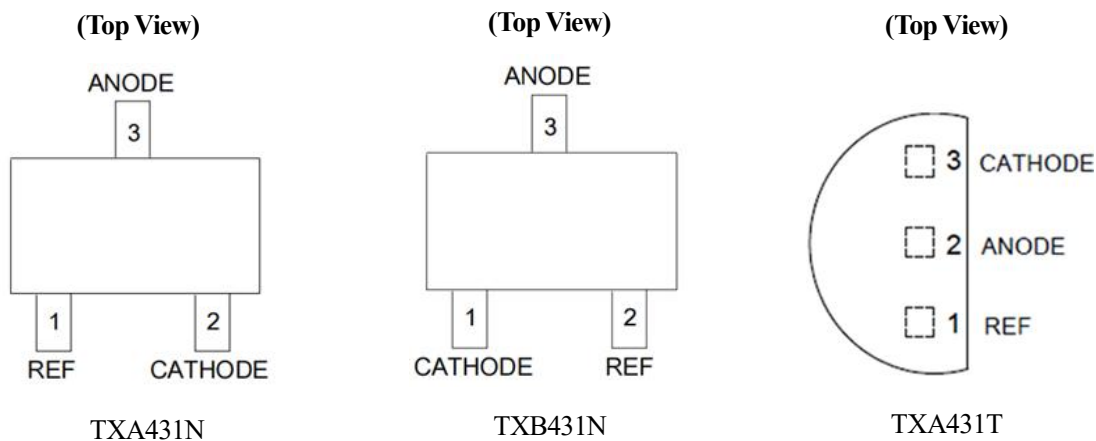


Figure 2. Pin Configuration of TX431

TXA431NR	TXB431NR	TXA431TR	Symbol	Description
1	2	1	REF	Threshold relative to common anode
2	1	3	CATHODE	Shunt Current/Voltage input
3	3	2	ANODE	Common pin, normally connected to ground

Ordering Information

Marking	Product	Package	RefVoltage (Vref)	Tape and Reel	Accuracy range
A431	TXA431NR	SOT23	2.495V	3000 pcs	±1.0% ±0.5%
B431	TXB431NR	SOT23B	2.495V	3000 pcs	
A431	TXA431TR	TO-92	2.495V	1000 pcs	

Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
V_{KA}	Cathode Voltage	40	V
I_{KA}	Cathode Current Range (Continuous)	-1 to 100	mA
I_{REF}	Reference Input Current Range	10	mA
P_D	Power Dissipation	370	mW
T_J	Junction Temperature	-40 to +150	°C
T_{STG}	Storage Temperature Range	-50 to +150	°C
T_{OPR}	Operating Temperature	-40 to +125	°C



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Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
V_{KA}	Cathode Voltage	V_{REF}	36	V
I_{KA}	Cathode Current	1.0	100	mA
T_A	Operating Ambient Temperature Range	-40	+125	°C

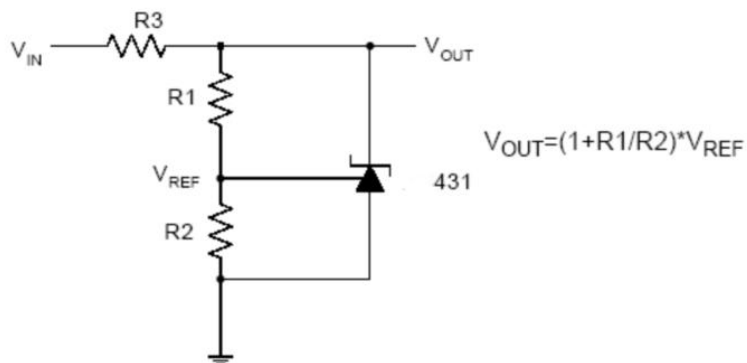
Electrical Characteristics (Operating Conditions: $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Symbol	Parameter	Test Circuit	Conditions	Min	Typ	Max	Unit	
V_{REF}	Reference Voltage	4	$V_{KA} = V_{REF}, I_{KA} = 10\text{mA}$	0.5%	2.483	2.495	2.507	V
				1.0%	2.470	2.495	2.520	
ΔV_{REF}	Deviation of Reference Voltage Over Full Temperature Range	4	$V_{KA} = V_{REF}, I_{KA} = 10\text{mA}$	0 to $+70^\circ\text{C}$	–	5	20	mV
				-40 to $+85^\circ\text{C}$	–	5	26	
				-40 to $+125^\circ\text{C}$	–	5	40	
$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	Ratio of Change in Reference Voltage to the Change in Cathode Voltage	5	$I_{KA} = 10\text{mA}$	$\Delta V_{KA} = 10\text{V to } V_{REF}$	–	-1.0	-2.7	mV/V
				$\Delta V_{KA} = 36\text{V to } 10\text{V}$	–	-0.5	-2.0	
I_{REF}	Reference Current	5	$I_{KA} = 10\text{mA}, R_1 = 10\text{K}\Omega, R_2 = \infty$	–	0.5	4.0	μA	
ΔI_{REF}	Deviation of Reference Current Over Full Temperature Range	5	$I_{KA} = 10\text{mA}, R_1 = 10\text{K}\Omega, R_2 = \infty, T_A = -40$ to $+125^\circ\text{C}$	–	0.4	1.2	μA	
I_{KA} (Min)	Minimum Cathode Current for Regulation	4	$V_{KA} = V_{REF}$	–	0.4	1.0	mA	
I_{KA} (Off)	Off-state Cathode Current	6	$V_{KA} = 36\text{V}, V_{REF} = 0$	–	0.1	1.0	μA	
Z_{KA}	Dynamic Impedance	4	$V_{KA} = V_{REF}, I_{KA} = 1$ to $100\text{mA}, f \leq 1.0\text{KHz}$	–	0.2	0.5	Ω	
θ_{JC}	Thermal Resistance	–	SOT-23	–	135.9	–	$^\circ\text{C/W}$	

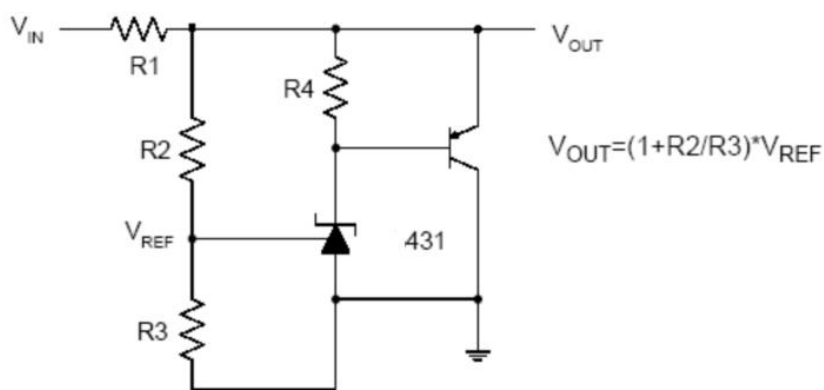


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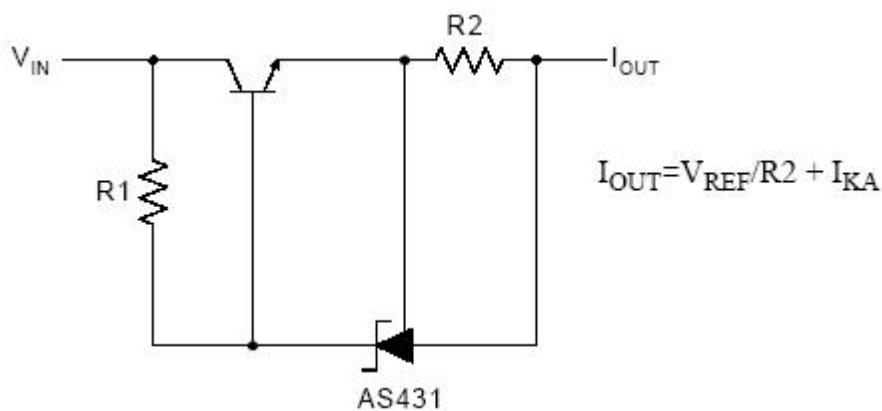
Typical Applications Circuit



Shunt Regulator



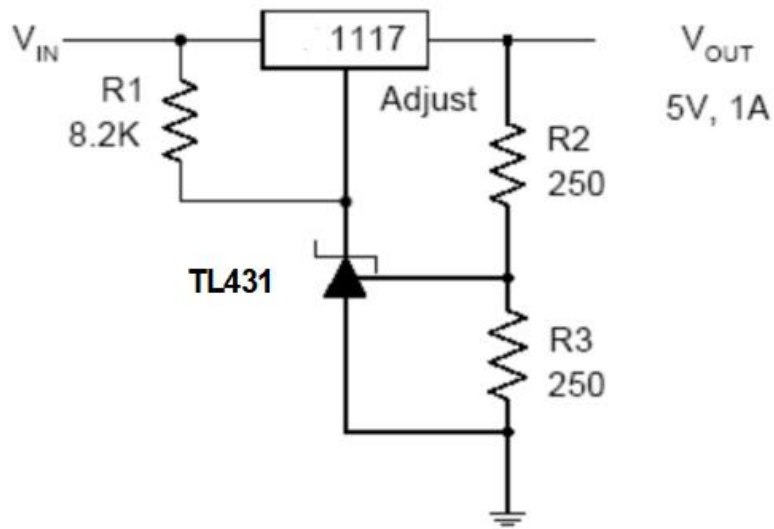
High Current Shunt Regulator



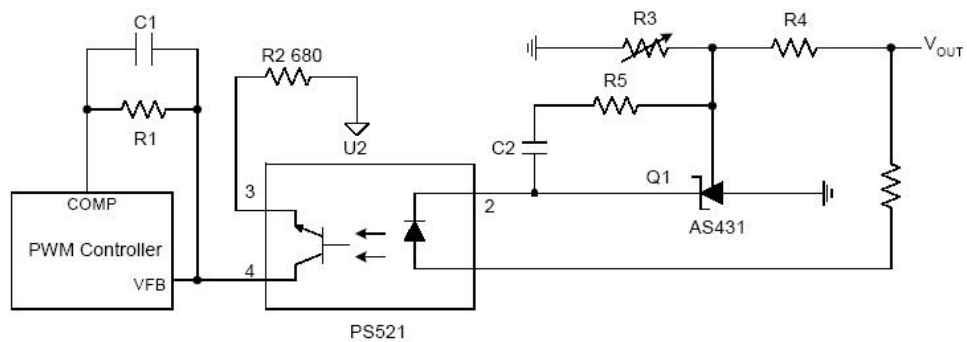
Current Source or Current Limit



TX431 Adjustable Precision Shunt Regulator



Precision 5V 1A Regulator

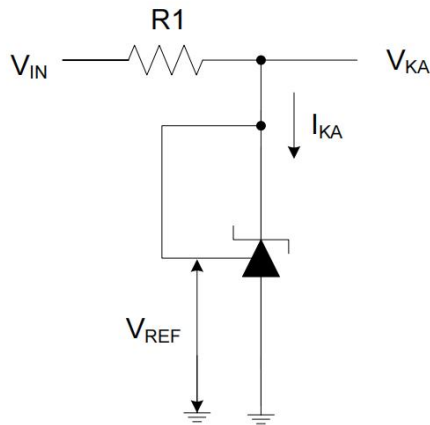


PWM Converter with Reference

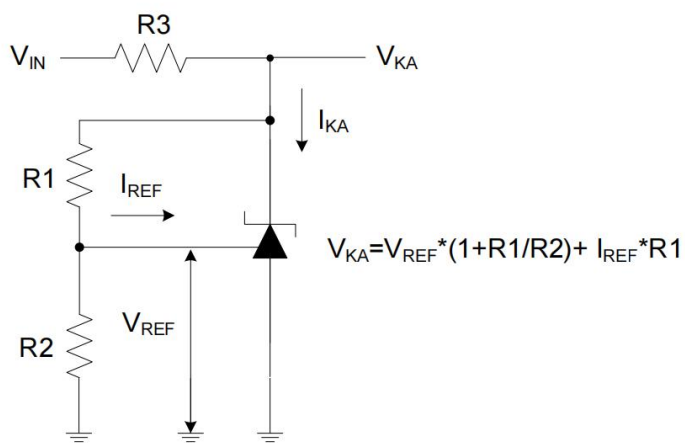


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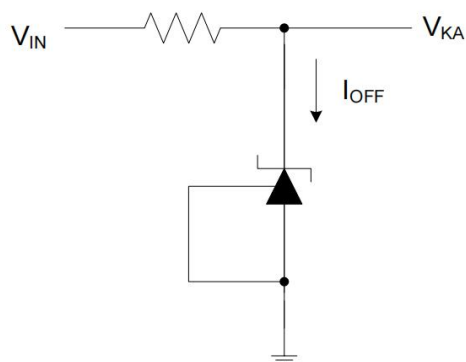
Electrical Characteristics (Cont.)



Test Circuit 4 for $V_{KA}=V_{REF}$



Test Circuit 5 for $V_{KA} > V_{REF}$

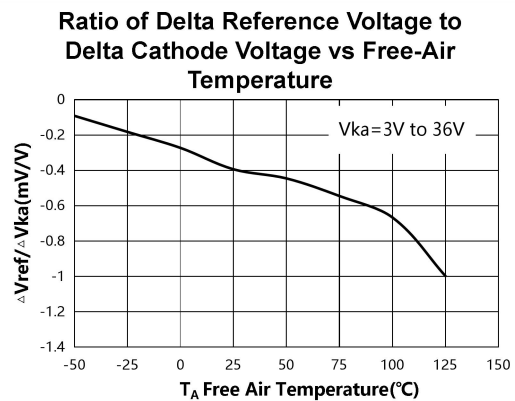
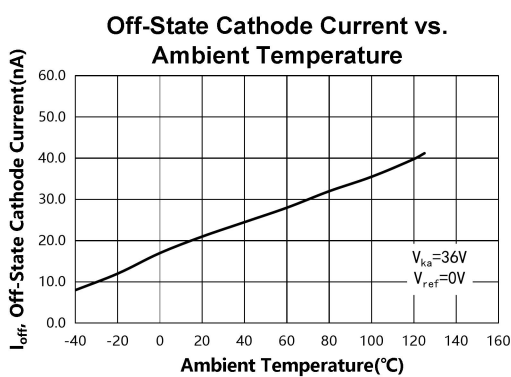
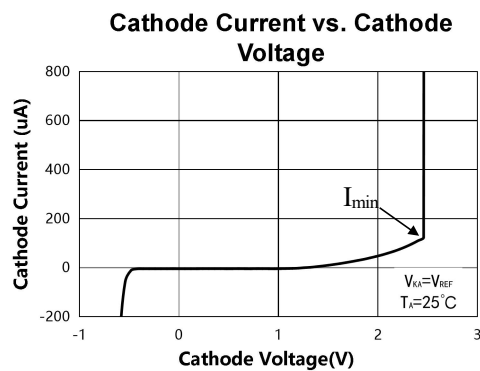
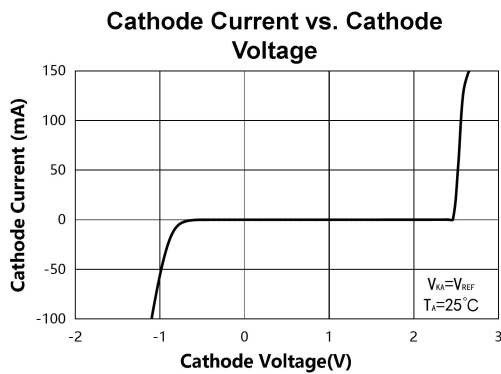
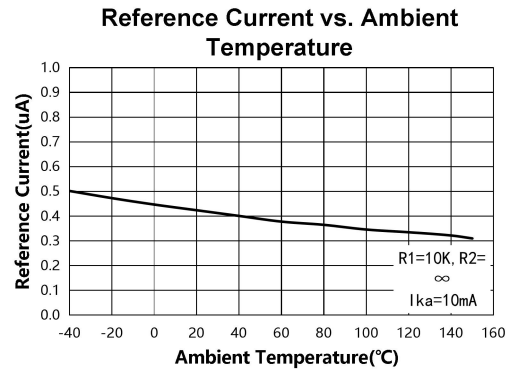
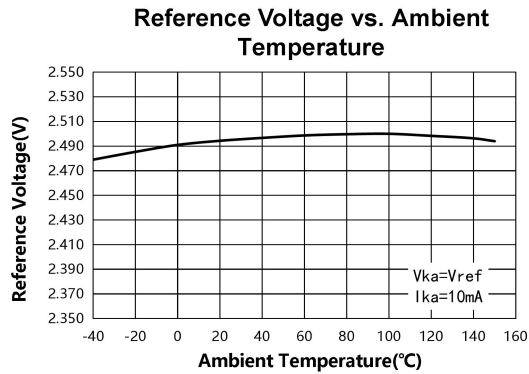


Test Circuit 6 for I_{OFF}



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Typical Performance Characteristics



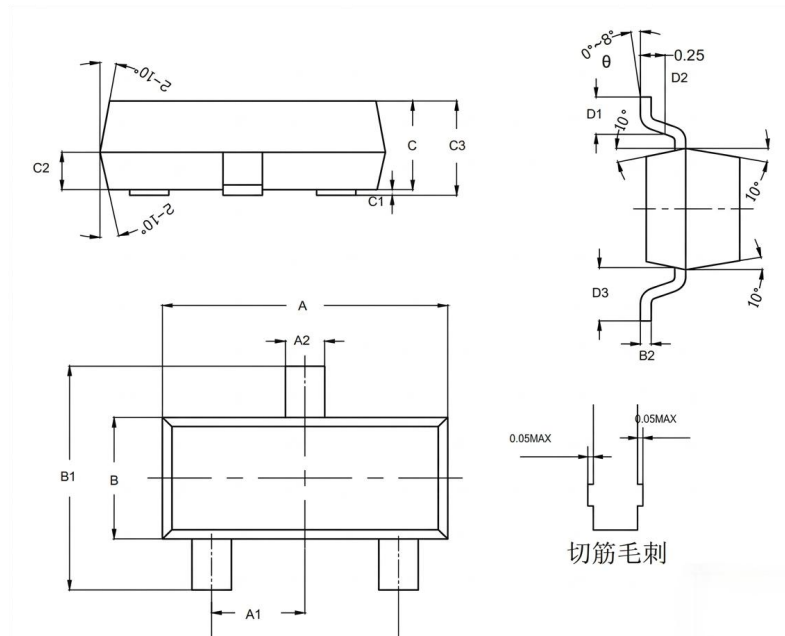


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TX431 Adjustable Precision Shunt Regulator

Package Outline Dimensions (Cont. All dimensions in mm(inch).)

3-pin SOT23 Outline Dimensions



Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min	Mid	Max	Min	Mid	Max
A	2.80	2.90	3.00	0.110	0.114	0.118
A1	0.85	0.95	1.05	0.033	0.037	0.041
A2	0.30	0.35	0.40	0.012	0.014	0.016
B	1.20	1.30	1.40	0.047	0.051	0.055
B1	2.25	2.40	2.55	0.089	0.094	0.100
B2	0.08	0.115	0.15	0.003	0.0045	0.006
C	0.90	1.00	1.10	0.035	0.039	0.043
C1	0.00	0.05	0.10	0.000	0.002	0.004
C2	0.30	0.40	0.50	0.012	0.016	0.020
C3	1.30MAX			0.051MAX		
D1	0.30	0.40	0.50	0.012	0.016	0.020
D2	0.25TYP			0.0098TYP		
D3	0.45	0.55	0.65	0.018	0.022	0.026
θ	0°	4°	8°	0°	4°	8°

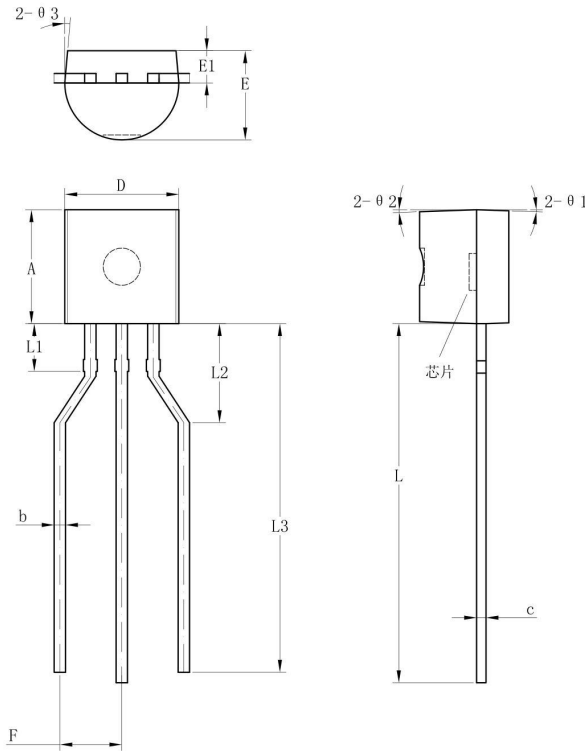


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TX431 Adjustable Precision Shunt Regulator

Package Outline Dimensions (All dimensions in mm(inch).)

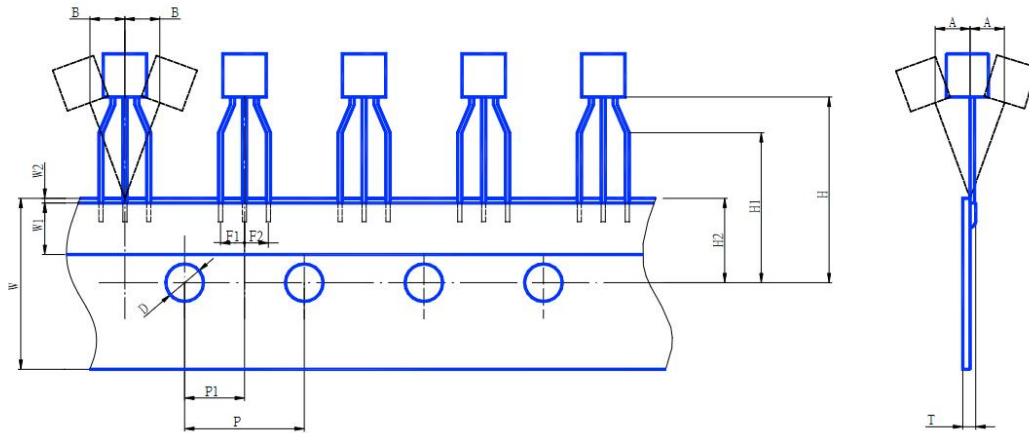
3-pin TO92 Outline Dimensions



Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min	Mid	Max	Min	Mid	Max
A	4.5	4.6	4.7	0.177	0.181	0.185
b	0.38	0.44	0.56	0.015	0.017	0.022
c	0.36	0.38	0.51	0.014	0.015	0.020
D	4.5	4.6	4.7	0.177	0.181	0.185
E	3.45	3.6	3.75	0.136	0.142	0.148
E1	1.2	1.3	1.4	0.047	0.051	0.055
F	2	2.5	3	0.079	0.098	0.118
L	13.5	14.5	15.3	0.531	0.571	0.602
L1	-	1.96	-	-	0.077	-
L2	2	3	4	0.079	0.118	0.157
L3	13.3	14.3	15.1	0.524	0.563	0.594
Θ1	-	2°	-	-	2°	-
Θ2	-	2°	-	-	2°	-
Θ3	-	5°	-	-	5°	-



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Item	Symbol	Specification(mm)
Front-rear tilt	ΔA	0 ± 1.0
Left-right deflection	ΔB	0 ± 1.0
Hole diameter of carrier tape	D	4.0 ± 0.3
Width of formed leads	F1, F2	$2.5 + 0.4$ -0.2
Distance from carrier tape hole center to bottom of plastic package	H	21.0max
Distance from TO-92 formed lead to carrier tape hole center	H1	16 ± 0.5
Distance from carrier tape hole center to carrier tape edge	H2	9.0 ± 0.5
Center-to-center distance between two holes on carrier tape	P	12.7 ± 0.3
Distance between middle lead of TO-92 and carrier tape hole center	P1	6.35 ± 0.5
Total thickness of TO-92 after packaging	T	1.5max
Width of carrier tape for TO-92	W	$18.0 + 1.0$ -0.5
Width of cover tape on carrier tape	W1	6.0 ± 0.5
Position of cover tape on carrier tape	W2	1.0max
Cumulative error range of center-to-center distance between two holes on carrier tape (20 pieces)	-	0 ± 1.0
Empty pocket requirement for carrier tape	-	Total empty pockets ≤ 9 , consecutive empty pockets ≤ 3



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